

## Notice for TAIYO YUDEN products

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Please read this notice before using the TAIYO YUDEN products.

### REMINDERS

- Product information in this catalog is as of October 2015. All of the contents specified herein are subject to change without notice due to technical improvements, etc. Therefore, please check for the latest information carefully before practical application or usage of the Products.

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- Please contact TAIYO YUDEN CO., LTD. for further details of product specifications as the individual specification is available.

- Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

- All electronic components or functional modules listed in this catalog are developed, designed and intended for use in general electronics equipment.(for AV, office automation, household, office supply, information service, telecommunications, (such as mobile phone or PC) etc.). Before incorporating the components or devices into any equipment in the field such as transportation,( automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact TAIYO YUDEN CO., LTD. for more detail in advance.

Do not incorporate the products into any equipment in fields such as aerospace, aviation, nuclear control, submarine system, military, etc. where higher safety and reliability are especially required.

In addition, even electronic components or functional modules that are used for the general electronic equipment, if the equipment or the electric circuit require high safety or reliability function or performances, a sufficient reliability evaluation check for safety shall be performed before commercial shipment and moreover, due consideration to install a protective circuit is strongly recommended at customer's design stage.

- The contents of this catalog are applicable to the products which are purchased from our sales offices or distributors (so called "TAIYO YUDEN' s official sales channel").

It is only applicable to the products purchased from any of TAIYO YUDEN' s official sales channel.

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# SMD POWER INDUCTORS



REFLOW

## PARTS NUMBER

\*Operating Temp.: -25~+105°C (Including self-generated heat)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |     |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|
| N | R | △ | 1 | 0 | 0 | 5 | 0 | T | △ | 1 | 0 | 0 | M | △   |
| ① |   |   | ② |   |   |   |   | ③ |   |   | ④ |   |   | ⑤ ⑥ |

△=Blank space

### ① Series name

| Code | Series name                 |
|------|-----------------------------|
| NR△  | Coating resin specification |

### ② Dimensions (L×H)

| Code  | Dimensions (L×H) [mm] |
|-------|-----------------------|
| 10050 | 10.0×5.0              |

### ③ Packaging

| Code | Packaging |
|------|-----------|
| T△   | Taping    |

### ④ Nominal inductance

| Code (example) | Nominal inductance [μH] |
|----------------|-------------------------|
| 1R3            | 1.3                     |
| 100            | 10                      |
| 101            | 100                     |

※R=Decimal point

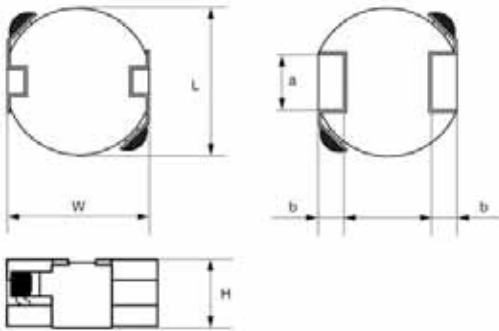
### ⑤ Inductance tolerance

| Code | Inductance tolerance |
|------|----------------------|
| M    | ±20%                 |
| N    | ±30%                 |

### ⑥ Internal code

| Code | Internal code |
|------|---------------|
| △    | standard      |

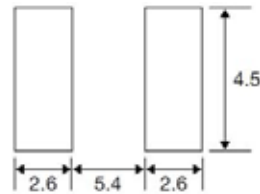
## STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY



### Recommended Land Patterns

#### Surface Mounting

- Mounting and soldering conditions should be checked beforehand.
- Applicable soldering process to these products is reflow soldering only.



Unit: mm

| Type     | L                         | W                        | H                      | a             | b              | Standard quantity [pcs] Taping |
|----------|---------------------------|--------------------------|------------------------|---------------|----------------|--------------------------------|
| NR 10050 | 10.0±0.3<br>(0.394±0.012) | 9.8±0.5<br>(0.386±0.020) | 5.0 max<br>(0.197 max) | 4.0<br>(0.16) | 1.75<br>(0.07) | 500                            |

Unit: mm (inch)

## PARTS NUMBER

### NR 10050 type

| Parts number   | EHS  | Nominal inductance [μH] | Inductance tolerance | Self-resonant frequency [MHz] (min.) | DC Resistance [Ω] (±30%) | Rated current ※) [mA]   |                               | Measuring frequency [kHz] |
|----------------|------|-------------------------|----------------------|--------------------------------------|--------------------------|-------------------------|-------------------------------|---------------------------|
|                |      |                         |                      |                                      |                          | Saturation current Idc1 | Temperature rise current Idc2 |                           |
| NR 10050T 1R3N | RoHS | 1.3                     | ±30%                 | 53                                   | 0.0068                   | 11,000                  | 9,000                         | 100                       |
| NR 10050T 2R1N | RoHS | 2.1                     | ±30%                 | 37                                   | 0.0080                   | 10,000                  | 8,300                         | 100                       |
| NR 10050T 2R9N | RoHS | 2.9                     | ±30%                 | 29                                   | 0.0093                   | 8,200                   | 7,300                         | 100                       |
| NR 10050T 3R8N | RoHS | 3.8                     | ±30%                 | 26                                   | 0.013                    | 7,300                   | 6,800                         | 100                       |
| NR 10050T 4R9N | RoHS | 4.9                     | ±30%                 | 23                                   | 0.015                    | 6,600                   | 6,000                         | 100                       |
| NR 10050T 6R5N | RoHS | 6.5                     | ±30%                 | 19                                   | 0.018                    | 6,000                   | 5,200                         | 100                       |
| NR 10050T 100M | RoHS | 10                      | ±20%                 | 15                                   | 0.025                    | 4,700                   | 4,100                         | 100                       |
| NR 10050T 150M | RoHS | 15                      | ±20%                 | 11                                   | 0.035                    | 3,600                   | 3,200                         | 100                       |
| NR 10050T 220M | RoHS | 22                      | ±20%                 | 10                                   | 0.045                    | 2,600                   | 2,500                         | 100                       |
| NR 10050T 330M | RoHS | 33                      | ±20%                 | 8.2                                  | 0.066                    | 2,500                   | 2,100                         | 100                       |
| NR 10050T 470M | RoHS | 47                      | ±20%                 | 7.0                                  | 0.092                    | 2,000                   | 1,800                         | 100                       |
| NR 10050T 680M | RoHS | 68                      | ±20%                 | 5.6                                  | 0.144                    | 1,700                   | 1,500                         | 100                       |
| NR 10050T 101M | RoHS | 100                     | ±20%                 | 4.6                                  | 0.209                    | 1,300                   | 1,200                         | 100                       |
| NR 10050T 221M | RoHS | 220                     | ±20%                 | 3.0                                  | 0.450                    | 1,000                   | 800                           | 100                       |

※) The saturation current value (Idc1) is the DC current value having inductance decrease down to 30%. (at 20°C)

※) The temperature rise current value (Idc2) is the DC current value having temperature increase up to 40°C. (at 20°C)

※) The maximum rated current is the DC current value that satisfies both of current value Saturation current value and temperature rise current value. (at 20°C)

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# SMD POWER INDUCTORS

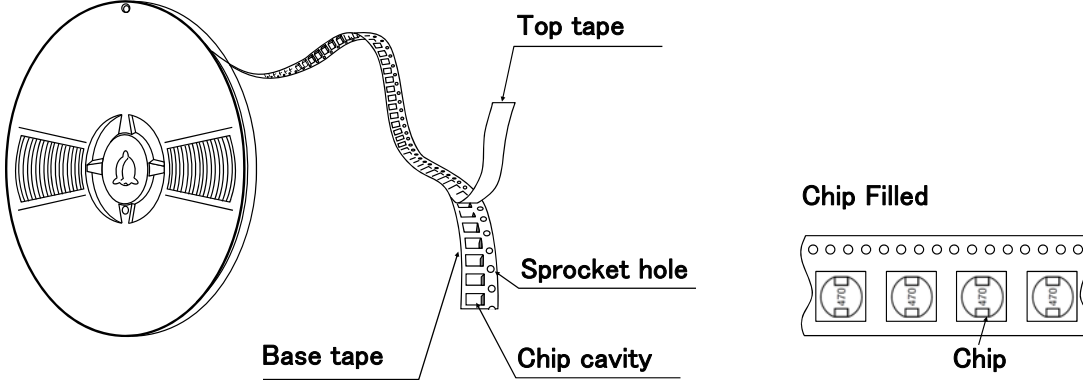
## PACKAGING

### ① Minimum Quantity

| Type     | Standard Quantity [pcs] |
|----------|-------------------------|
|          | Tape & Reel             |
| NR 10050 | 500                     |

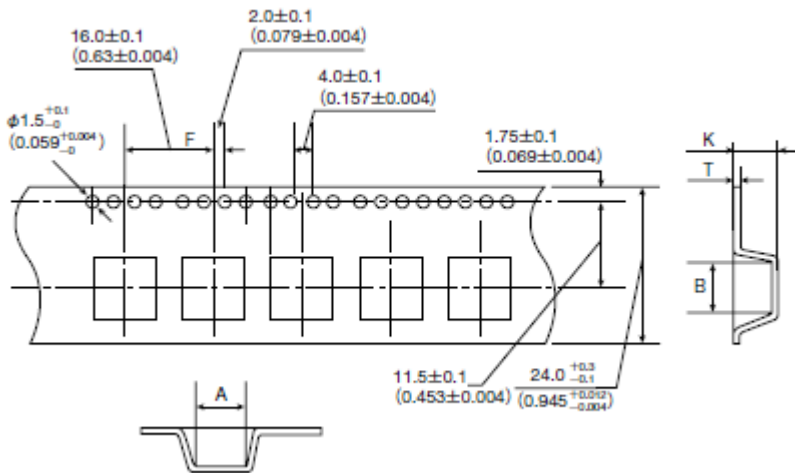
### ② Tape Material

#### ● Embossed Tape



### ③ Taping dimensions

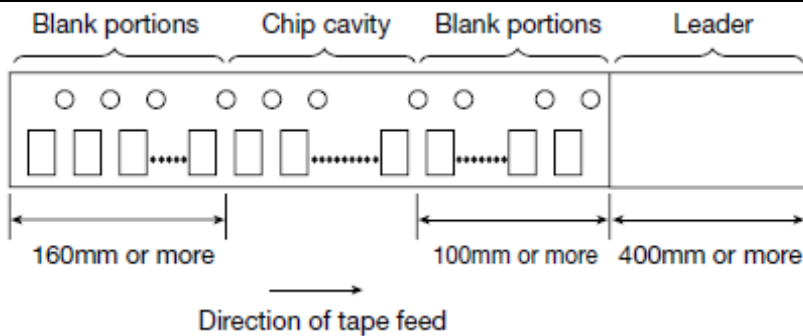
#### ● Embossed tape 24mm wide (0.945 inches wide)



| Type     | Chip cavity                       |                                  | Insertion pitch                   | Tape thickness                    |                                  |
|----------|-----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|
|          | A                                 | B                                | F                                 | T                                 | K                                |
| NR 10050 | $10.4 \pm 0.1$<br>(0.409 ± 0.004) | $9.9 \pm 0.1$<br>(0.390 ± 0.004) | $16.0 \pm 0.1$<br>(0.630 ± 0.004) | $0.5 \pm 0.05$<br>(0.020 ± 0.002) | $5.7 \pm 0.1$<br>(0.224 ± 0.004) |

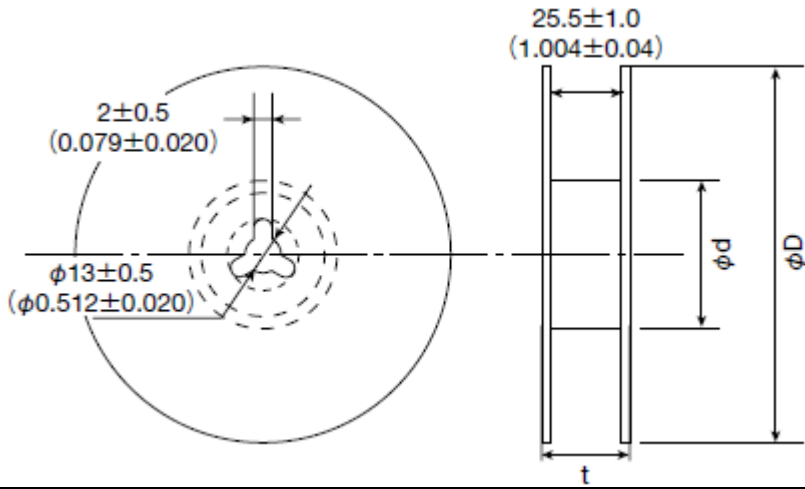
Unit : mm (inch)

### ④ Leader and Blank portion



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⑤ Reel size

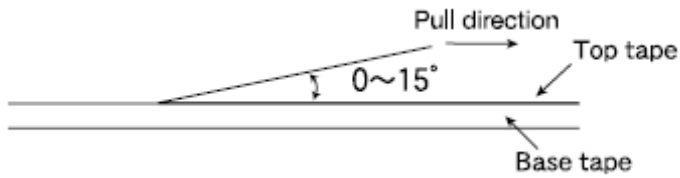


| Type     | Reel size (Reference value)          |                                    |                       |
|----------|--------------------------------------|------------------------------------|-----------------------|
|          | $\phi D$                             | $\phi d$                           | t (max.)              |
| NR 10050 | $330 \pm 3$<br>( $12.99 \pm 0.118$ ) | $80 \pm 2$<br>( $3.15 \pm 0.078$ ) | $30.5$<br>( $1.201$ ) |

Unit : mm (inch)

⑥ Top Tape Strength

The top tape requires a peel-off force of 0.1 to 1.3N in the direction of the arrow as illustrated below.



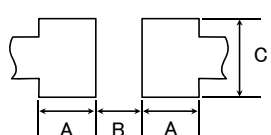
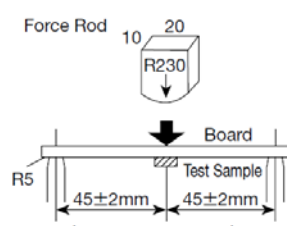
# SMD POWER INDUCTORS (NR□, NS SERIES)

## RELIABILITY DATA

| 1. Operating Temperature Range |   |                                |
|--------------------------------|---|--------------------------------|
| Specified Value                | NR30/40/50/60/80, NRS20, NRV20/30, NRH24/30 Type  | -25~+120°C                     |
|                                | NRS40/50/60/80 Type   | -25~+125°C                     |
|                                | NR10050 Type  | -25~+105°C                     |
|                                | NS101, NS125 Type   | -40~+125°C                     |
| Test Methods and Remarks       | Including self-generated heat   |                                |
| 2. Storage Temperature Range   |   |                                |
| Specified Value                | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type  | -40~+85°C                      |
|                                | NR10050 Type  |                                |
|                                | NS101, NS125 Type   |                                |
| Test Methods and Remarks       | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>-5 to 40°C for the product with taping.   |                                |
| 3. Rated current               |   |                                |
| Specified Value                | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type  | Within the specified tolerance |
|                                | NR10050 Type  |                                |
|                                | NS101, NS125 Type   |                                |
| 4. Inductance                  |   |                                |
| Specified Value                | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type  | Within the specified tolerance |
|                                | NR10050 Type  |                                |
|                                | NS101, NS125 Type   |                                |
| Test Methods and Remarks       | Measuring equipment : LCR Meter (HP 4285A or equivalent)<br>Measuring frequency : Specified frequency<br>NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>Measuring equipment : LCR Meter (HP 4285A or equivalent)<br>Measuring frequency : 100kHz, 1V<br>NR10050 Type :<br>Measuring equipment : LCR Meter (HP 4263A or equivalent)<br>Measuring frequency : 100kHz, 1V |                                |
| 5. DC Resistance               |   |                                |
| Specified Value                | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type  | Within the specified tolerance |
|                                | NR10050 Type  |                                |
|                                | NS101, NS125 Type   |                                |
| Test Methods and Remarks       | Measuring equipment : DC ohmmeter (HIOKI 3227 or equivalent)  |                                |
| 6. Self resonance frequency    |   |                                |
| Specified Value                | NR30/40/50/60/80, NRV30, NRH24/30, NRS40/50/60/80 Type  | Within the specified tolerance |
|                                | NR10050 Type  |                                |
|                                | NS101, NS125 Type   | -                              |
| Test Methods and Remarks       | NR30/40/50/60/80, NRV30, NRH24/30, NRS40/50/60/80 Type, NR10050 Type :<br>Measuring equipment : Impedance analyzer/material analyzer (HP4291A or equivalent HP4191A, 4192A or equivalent)   |                                |

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| 7. Temperature characteristic |  |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
|-------------------------------|--|---------------------------------------|------------------------------------|---|----|---|-------------------------------|---|---------------------------|---|-------------------------------|---|----|--|
| Specified Value               | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Inductance change : Within $\pm 20\%$ |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
|                               | NR10050 Type   |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
|                               | NS101, NS125 Type  | Inductance change : Within $\pm 15\%$ |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
| Test Methods and Remarks      | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type :<br>Measurement of inductance shall be taken at temperature range within $-25^{\circ}\text{C}\sim +85^{\circ}\text{C}$ .<br>With reference to inductance value at $+20^{\circ}\text{C}$ ., change rate shall be calculated.  |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
|                               | NS101, NS125 Type :<br>Measurement of inductance shall be taken at temperature range within $-40^{\circ}\text{C}\sim +125^{\circ}\text{C}$ .<br>With reference to inductance value at $+20^{\circ}\text{C}$ ., change rate shall be calculated.<br>Change of maximum inductance deviation in step 1 to 5   |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
|                               | <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (<math>^{\circ}\text{C}</math>)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> </tr> <tr> <td>2</td> <td>Minimum operating temperature</td> </tr> <tr> <td>3</td> <td>20 (Standard temperature)</td> </tr> <tr> <td>4</td> <td>Maximum operating temperature</td> </tr> <tr> <td>5</td> <td>20</td> </tr> </tbody> </table> | Step                                  | Temperature ( $^{\circ}\text{C}$ ) | 1 | 20 | 2 | Minimum operating temperature | 3 | 20 (Standard temperature) | 4 | Maximum operating temperature | 5 | 20 |  |
| Step                          | Temperature ( $^{\circ}\text{C}$ )   |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
| 1                             | 20   |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
| 2                             | Minimum operating temperature  |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
| 3                             | 20 (Standard temperature)  |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
| 4                             | Maximum operating temperature  |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |
| 5                             | 20   |                                       |                                    |   |    |   |                               |   |                           |   |                               |   |    |  |

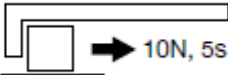
| 8. Resistance to flexure of substrate |   |           |     |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
|---------------------------------------|---|-----------|-----|---|---|--------------|------|-----|-----|-------|-----|------|-----|--------------------|-----|-----|-----|-------------|-----|-----|-----|-------------|-----|-----|-----|-------------|-----|-----|-----|-------------|-----|-----|-----|------|---|---|---|-------|-----|-----|-----|-------|-----|-----|
| Specified Value                       | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type   | No damage |     |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
|                                       | NR10050 Type  | —         |     |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
|                                       | NS101, NS125 Type   | No damage |     |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| Test Methods and Remarks              | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow. As illustrated below, apply force in the direction of the arrow indicating until deflection of the test board reaches to 2 mm.<br>Test board size : $100 \times 40 \times 1.0$<br>Test board material : Glass epoxy-resin<br>Solder cream thickness : 0.10mm (NR30, NRS20, NRH24/30, NRV20/30)<br>: 0.15mm (NR40/50/60/80, NRS40/50/60, NS101/125Type)  |           |     |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
|                                       | <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;"> <p>Land dimension</p>  </div> <table border="1"> <thead> <tr> <th>Type</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>NRS20, NRV20</td> <td>0.65</td> <td>0.7</td> <td>2.0</td> </tr> <tr> <td>NRH24</td> <td>0.7</td> <td>0.75</td> <td>2.0</td> </tr> <tr> <td>NR30, NRV30, NRH30</td> <td>0.8</td> <td>1.4</td> <td>2.7</td> </tr> <tr> <td>NR40, NRS40</td> <td>1.2</td> <td>1.6</td> <td>3.7</td> </tr> <tr> <td>NR50, NRS50</td> <td>1.5</td> <td>2.1</td> <td>4.0</td> </tr> <tr> <td>NR60, NRS60</td> <td>1.6</td> <td>3.1</td> <td>5.7</td> </tr> <tr> <td>NR80, NRS80</td> <td>1.8</td> <td>3.8</td> <td>7.5</td> </tr> </tbody> </table> </div> <div style="margin-left: 20px;">  <table border="1"> <thead> <tr> <th>Type</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>NS101</td> <td>2.5</td> <td>5.6</td> <td>3.2</td> </tr> <tr> <td>NS125</td> <td>2.5</td> <td>8.6</td> <td>3.2</td> </tr> </tbody> </table> </div> | Type      | A   | B | C | NRS20, NRV20 | 0.65 | 0.7 | 2.0 | NRH24 | 0.7 | 0.75 | 2.0 | NR30, NRV30, NRH30 | 0.8 | 1.4 | 2.7 | NR40, NRS40 | 1.2 | 1.6 | 3.7 | NR50, NRS50 | 1.5 | 2.1 | 4.0 | NR60, NRS60 | 1.6 | 3.1 | 5.7 | NR80, NRS80 | 1.8 | 3.8 | 7.5 | Type | A | B | C | NS101 | 2.5 | 5.6 | 3.2 | NS125 | 2.5 | 8.6 |
| Type                                  | A   | B         | C   |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NRS20, NRV20                          | 0.65  | 0.7       | 2.0 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NRH24                                 | 0.7   | 0.75      | 2.0 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NR30, NRV30, NRH30                    | 0.8   | 1.4       | 2.7 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NR40, NRS40                           | 1.2   | 1.6       | 3.7 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NR50, NRS50                           | 1.5   | 2.1       | 4.0 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NR60, NRS60                           | 1.6   | 3.1       | 5.7 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NR80, NRS80                           | 1.8   | 3.8       | 7.5 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| Type                                  | A   | B         | C   |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NS101                                 | 2.5   | 5.6       | 3.2 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |
| NS125                                 | 2.5   | 8.6       | 3.2 |   |   |              |      |     |     |       |     |      |     |                    |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |             |     |     |     |      |   |   |   |       |     |     |     |       |     |     |

| 9. Insulation resistance : between wires |   |   |
|--|---|---|
| Specified Value                          | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type | — |
|  | NR10050 Type  |   |
|  | NS101, NS125 Type   |   |

| 10. Insulation resistance : between wire and core |   |   |
|---|---|---|
| Specified Value                                   | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type | — |
|   | NR10050 Type  |   |
|   | NS101, NS125 Type   |   |

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| 11. Withstanding voltage : between wire and core |   |   |
|--|---|---|
| Specified Value                                  | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type | — |
|  | NR10050 Type  |   |
|  | NS101, NS125 Type   |   |

| 12. Adhesion of terminal electrode |  |                             |
|------------------------------------|--|-----------------------------|
| Specified Value                    | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Shall not come off PC board |
|                                    | NR10050 Type   |                             |
|                                    | NS101, NS125 Type  |                             |
| Test Methods and Remarks           | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow.<br>Applied force : 10N to X and Y directions.<br>Duration : 5s.<br>Solder cream thickness : 0.10mm (NR30, NRS20, NRH24/30, NRV20/30)<br>: 0.15mm (NR40/50/60/80, NRS40/50/60, NS101/125Type) |                             |
|                                    | <br>NR10050 Type<br>Applied force : 5N to X and Y directions.<br>Duration : 5s.   |                             |

| 13. Resistance to vibration |   |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
|-----------------------------|---|--|---------|--|-----------------|--|--|-----------------|--------------------------------|--|------|---|---------------------------------------|---|---|
| Specified Value             | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type   | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance. |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
|                             | NR10050 Type  |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
|                             | NS101, NS125 Type   |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
| Test Methods and Remarks    | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow.<br>Then it shall be submitted to below test conditions.   |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
|                             | <table border="1" data-bbox="295 1164 1129 1344"> <tr> <td>Frequency Range</td> <td colspan="2">10~55Hz</td> </tr> <tr> <td>Total Amplitude</td> <td colspan="2">1.5mm (May not exceed acceleration 196m/s<sup>2</sup>)</td> </tr> <tr> <td>Sweeping Method</td> <td colspan="2">10Hz to 55Hz to 10Hz for 1min.</td> </tr> <tr> <td rowspan="3">Time</td> <td>X</td> <td rowspan="3">For 2 hours on each X, Y, and Z axis.</td> </tr> <tr> <td>Y</td> </tr> <tr> <td>Z</td> </tr> </table><br>Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. | Frequency Range  | 10~55Hz |  | Total Amplitude | 1.5mm (May not exceed acceleration 196m/s <sup>2</sup> ) |  | Sweeping Method | 10Hz to 55Hz to 10Hz for 1min. |  | Time | X | For 2 hours on each X, Y, and Z axis. | Y | Z |
| Frequency Range             | 10~55Hz   |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
| Total Amplitude             | 1.5mm (May not exceed acceleration 196m/s <sup>2</sup> )  |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
| Sweeping Method             | 10Hz to 55Hz to 10Hz for 1min.  |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
| Time                        | X   | For 2 hours on each X, Y, and Z axis.  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
|                             | Y   |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |
|                             | Z   |  |         |  |                 |  |  |                 |                                |  |      |   |                                       |   |   |

| 14. Solderability        |  |   |                          |      |                  |
|--------------------------|--|---|--------------------------|------|------------------|
| Specified Value          | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | At least 90% of surface of terminal electrode is covered by new solder. |                          |      |                  |
|                          | NR10050 Type   |   |                          |      |                  |
|                          | NS101, NS125 Type  |   |                          |      |                  |
| Test Methods and Remarks | The test samples shall be dipped in flux, and then immersed in molten solder as shown in below table.<br>Flux : Methanol solution containing rosin 25%.<br>NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type                                    |   |                          |      |                  |
|                          | <table border="1" data-bbox="279 1697 699 1758"> <tr> <td>Solder Temperature</td> <td>245<math>\pm</math>5<math>^{\circ}</math>C</td> </tr> <tr> <td>Time</td> <td>5<math>\pm</math>1.0 sec.</td> </tr> </table><br>※Immersion depth : All sides of mounting terminal shall be immersed. | Solder Temperature  | 245 $\pm$ 5 $^{\circ}$ C | Time | 5 $\pm$ 1.0 sec. |
| Solder Temperature       | 245 $\pm$ 5 $^{\circ}$ C   |   |                          |      |                  |
| Time                     | 5 $\pm$ 1.0 sec.   |   |                          |      |                  |

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| 15. Resistance to soldering heat |  |  |
|----------------------------------|--|--|
| Specified Value                  | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance. |
|                                  | NR10050 Type   |  |
|                                  | NS101, NS125 Type  |  |
| Test Methods and Remarks         | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>The test sample shall be exposed to reflow oven at $230\pm 5^{\circ}\text{C}$ for 40 seconds, with peak temperature at $260\pm 5^{\circ}\text{C}$ for 5 seconds, 2 times.<br><br>NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NS101/125 Type<br>Test board material : Glass epoxy-resin<br>Test board thickness : 1.0mm<br>NR10050 Type<br>Test board material : Glass epoxy-resin<br>Test board thickness : 1.6mm<br>Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  |

| 16. Thermal shock        |  |  |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
|--------------------------|--|--|-----------------------|--|--|------|------------------------------------|----------------|---|------------|-----------|---|------------------|----------|---|------------|-----------|---|------------------|----------|
| Specified Value          | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance. |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
|                          | NR10050 Type   |  |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
|                          | NS101, NS125 Type  |  |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
| Test Methods and Remarks | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow. The test samples shall be placed at specified temperature for specified time by step 1 to step 4 as shown in below table in sequence. The temperature cycle shall be repeated 100 cycles. <table border="1" style="margin: 10px auto;"> <thead> <tr> <th colspan="3">Conditions of 1 cycle</th> </tr> <tr> <th>Step</th> <th>Temperature (<math>^{\circ}\text{C}</math>)</th> <th>Duration (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-40\pm 3</math></td> <td><math>30\pm 3</math></td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td><math>+85\pm 2</math></td> <td><math>30\pm 3</math></td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>Within 3</td> </tr> </tbody> </table> Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  | Conditions of 1 cycle |  |  | Step | Temperature ( $^{\circ}\text{C}$ ) | Duration (min) | 1 | $-40\pm 3$ | $30\pm 3$ | 2 | Room temperature | Within 3 | 3 | $+85\pm 2$ | $30\pm 3$ | 4 | Room temperature | Within 3 |
| Conditions of 1 cycle    |  |  |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
| Step                     | Temperature ( $^{\circ}\text{C}$ )   | Duration (min)   |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
| 1                        | $-40\pm 3$   | $30\pm 3$  |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
| 2                        | Room temperature   | Within 3   |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
| 3                        | $+85\pm 2$   | $30\pm 3$  |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |
| 4                        | Room temperature   | Within 3   |                       |  |  |      |                                    |                |   |            |           |   |                  |          |   |            |           |   |                  |          |

| 17. Damp heat            |   |  |             |                           |          |          |      |                |
|--------------------------|---|--|-------------|---------------------------|----------|----------|------|----------------|
| Specified Value          | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type   | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance. |             |                           |          |          |      |                |
|                          | NR10050 Type  |  | —           |                           |          |          |      |                |
|                          | NS101, NS125 Type   | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance. |             |                           |          |          |      |                |
| Test Methods and Remarks | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow.<br>The test samples shall be placed in thermostatic oven set at specified temperature and humidity as shown in below table. <table border="1" style="margin: 10px auto;"> <tbody> <tr> <td>Temperature</td> <td><math>60\pm 2^{\circ}\text{C}</math></td> </tr> <tr> <td>Humidity</td> <td>90~95%RH</td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </tbody> </table> Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  | Temperature | $60\pm 2^{\circ}\text{C}$ | Humidity | 90~95%RH | Time | 500+24/-0 hour |
| Temperature              | $60\pm 2^{\circ}\text{C}$   |  |             |                           |          |          |      |                |
| Humidity                 | 90~95%RH  |  |             |                           |          |          |      |                |
| Time                     | 500+24/-0 hour  |  |             |                           |          |          |      |                |

| 18. Loading under damp heat |   |  |             |                           |          |          |                 |               |      |                |
|-----------------------------|---|--|-------------|---------------------------|----------|----------|-----------------|---------------|------|----------------|
| Specified Value             | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type   | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance. |             |                           |          |          |                 |               |      |                |
|                             | NR10050 Type  |  |             |                           |          |          |                 |               |      |                |
|                             | NS101, NS125 Type   |  |             |                           |          |          |                 |               |      |                |
| Test Methods and Remarks    | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow.<br>The test samples shall be placed in thermostatic oven set at specified temperature and humidity and applied the rated current continuously as shown in below table. <table border="1" style="margin: 10px auto;"> <tbody> <tr> <td>Temperature</td> <td><math>60\pm 2^{\circ}\text{C}</math></td> </tr> <tr> <td>Humidity</td> <td>90~95%RH</td> </tr> <tr> <td>Applied current</td> <td>Rated current</td> </tr> <tr> <td>Time</td> <td>500+24/-0 hour</td> </tr> </tbody> </table> Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  | Temperature | $60\pm 2^{\circ}\text{C}$ | Humidity | 90~95%RH | Applied current | Rated current | Time | 500+24/-0 hour |
| Temperature                 | $60\pm 2^{\circ}\text{C}$   |  |             |                           |          |          |                 |               |      |                |
| Humidity                    | 90~95%RH  |  |             |                           |          |          |                 |               |      |                |
| Applied current             | Rated current   |  |             |                           |          |          |                 |               |      |                |
| Time                        | 500+24/-0 hour  |  |             |                           |          |          |                 |               |      |                |

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| 19. Low temperature life test   |  |  |
|---|--|--|
| Specified Value   | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance.   |
|   | NR10050 Type   |  |
|   | NS101, NS125 Type  |  |
| Test Methods and Remarks  | NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type :<br>The test samples shall be soldered to the test board by the reflow. After that, the test samples shall be placed at test conditions as shown in below table. |  |
|   | Temperature  | $-40 \pm 2^{\circ}\text{C}$  |
|   | Time   | $500 + 24 / - 0$ hour  |
| Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  |  |
| 20. High temperature life test  |  |  |
| Specified Value   | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | —  |
|   | NR10050 Type   | —  |
|   | NS101, NS125 Type  | —  |
| Test Methods and Remarks  | NR10050 Type :   |  |
|   | Temperature  | $105 \pm 3^{\circ}\text{C}$  |
|   | Time   | $500 + 24 / - 0$ hour  |
| Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  |  |
| 21. Loading at high temperature life test   |  |  |
| Specified Value   | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance.   |
|   | NR10050 Type   | —  |
|   | NS101, NS125 Type  | Inductance change : Within $\pm 10\%$<br>No significant abnormality in appearance.   |
| Test Methods and Remarks  | NR30/40/50/60/80, NRV30, NRH24/30, NRS40/50/60/80 Type, NS12555, NS12565, NS12575 Type :<br>The test samples shall be soldered to the test board by the reflow soldering.  |  |
|   | Temperature  | $85 \pm 2^{\circ}\text{C}$   |
|   | Applied current  | Rated current  |
|   | Time   | $500 + 24 / - 0$ hour  |
| Recovery : At least 2hrs of recovery under the standard condition after the test, followed by the measurement within 48hrs. |  |  |
| 22. Standard condition  |  |  |
| Specified Value   | NR30/40/50/60/80, NRV20/30,<br>NRH24/30, NRS20/40/50/60/80 Type  | Standard test condition :<br>Unless otherwise specified, temperature is $20 \pm 15^{\circ}\text{C}$ and $65 \pm 20\%$ of relative humidity.<br>When there is any question concerning measurement result: In order to provide correlation data, the test shall be condition of $20 \pm 2^{\circ}\text{C}$ of temperature, $65 \pm 5\%$ relative humidity.<br>Inductance is in accordance with our measured value. |
|   | NR10050 Type   |  |
|   | NS101, NS125 Type  |  |

# SMD POWER INDUCTORS (NR□, NS SERIES)

## PRECAUTIONS

| 1. Circuit Design                         |   |
|---|---|
| Precautions                               | <ul style="list-style-type: none"> <li>◆ Operating environment               <ol style="list-style-type: none"> <li>1. The products described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance.</li> </ol> </li> </ul>   |
| 2. PCB Design                             |   |
| Precautions                               | <ul style="list-style-type: none"> <li>◆ Land pattern design               <ol style="list-style-type: none"> <li>1. Please refer to a recommended land pattern.</li> </ol> </li> </ul>   |
| Technical considerations                  | <ul style="list-style-type: none"> <li>◆ Land pattern design</li> <li>Surface Mounting               <ul style="list-style-type: none"> <li>• Mounting and soldering conditions should be checked beforehand.</li> <li>• Applicable soldering process to this products is reflow soldering only.</li> </ul> </li> </ul>   |
| 3. Considerations for automatic placement |   |
| Precautions                               | <ul style="list-style-type: none"> <li>◆ Adjustment of mounting machine               <ol style="list-style-type: none"> <li>1. Excessive impact load should not be imposed on the products when mounting onto the PC boards.</li> <li>2. Mounting and soldering conditions should be checked beforehand.</li> </ol> </li> </ul>  |
| Technical considerations                  | <ul style="list-style-type: none"> <li>◆ Adjustment of mounting machine               <ol style="list-style-type: none"> <li>1. When installing products, care should be taken not to apply distortion stress as it may deform the products.</li> </ol> </li> </ul>   |
| 4. Soldering                              |   |
| Precautions                               | <ul style="list-style-type: none"> <li>◆ Reflow soldering               <ol style="list-style-type: none"> <li>1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified.</li> <li>2. The product shall be used reflow soldering only.</li> <li>3. Please do not add any stress to a product until it returns in normal temperature after reflow soldering.</li> </ol> </li> <li>◆ Lead free soldering               <ol style="list-style-type: none"> <li>1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, soldering etc sufficiently.</li> </ol> </li> <li>◆ Recommended conditions for using a soldering iron (NR10050 Type)               <ul style="list-style-type: none"> <li>• Put the soldering iron on the land-pattern.</li> <li>• Soldering iron's temperature - Below 350°C</li> <li>• Duration - 3 seconds or less</li> <li>• The soldering iron should not directly touch the inductor.</li> </ul> </li> </ul> |
| Technical considerations                  | <ul style="list-style-type: none"> <li>◆ Reflow soldering               <ol style="list-style-type: none"> <li>1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.                   <ul style="list-style-type: none"> <li>• NR30/40/50/60/80, NRV20/30, NRH24/30, NRS20/40/50/60/80 Type, NR10050 Type, NS101/125 Type</li> </ul> </li> </ol> </li> </ul> <p style="margin-left: 20px;">Recommended reflow condition (Pb free solder)</p>  |
| 5. Cleaning                               |   |
| Precautions                               | <ul style="list-style-type: none"> <li>◆ Cleaning conditions               <ol style="list-style-type: none"> <li>1. Washing by supersonic waves shall be avoided.</li> </ol> </li> </ul>   |
| Technical considerations                  | <ul style="list-style-type: none"> <li>◆ Cleaning conditions               <ol style="list-style-type: none"> <li>1. If washed by supersonic waves, the products might be broken.</li> </ol> </li> </ul>  |

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| 6. Handling              |  |
|--------------------------|--|
| Precautions              | <ul style="list-style-type: none"> <li>◆ Handling               <ol style="list-style-type: none"> <li>1. Keep the product away from all magnets and magnetic objects.</li> </ol> </li> <li>◆ Breakaway PC boards (splitting along perforations)               <ol style="list-style-type: none"> <li>1. When splitting the PC board after mounting product, care should be taken not to give any stresses of deflection or twisting to the board.</li> <li>2. Board separation should not be done manually, but by using the appropriate devices.</li> </ol> </li> <li>◆ Mechanical considerations               <ol style="list-style-type: none"> <li>1. Please do not give the product any excessive mechanical shocks.</li> <li>2. Please do not add any shock and power to a product in transportation.</li> </ol> </li> <li>◆ Pick-up pressure               <ol style="list-style-type: none"> <li>1. Please do not push to add any pressure to a winding part. Please do not give any shock and push into a ferrite core exposure part.</li> </ol> </li> <li>◆ Packing               <ol style="list-style-type: none"> <li>1. Please avoid accumulation of a packing box as much as possible.</li> </ol> </li> </ul> |
| Technical considerations | <ul style="list-style-type: none"> <li>◆ Handling               <ol style="list-style-type: none"> <li>1. There is a case that a characteristic varies with magnetic influence.</li> </ol> </li> <li>◆ Breakaway PC boards (splitting along perforations)               <ol style="list-style-type: none"> <li>1. The position of the product on PCBs shall be carefully considered to minimize the stress caused from splitting of the PCBs.</li> </ol> </li> <li>◆ Mechanical considerations               <ol style="list-style-type: none"> <li>1. There is a case to be damaged by a mechanical shock.</li> <li>2. There is a case to be broken by the handling in transportation.</li> </ol> </li> <li>◆ Pick-up pressure               <ol style="list-style-type: none"> <li>1. Damage and a characteristic can vary with an excessive shock or stress.</li> </ol> </li> <li>◆ Packing               <ol style="list-style-type: none"> <li>1. If packing boxes are accumulated, that could cause a deformation on packing tapes or a damage on the products.</li> </ol> </li> </ul>   |
| 7. Storage conditions    |  |
| Precautions              | <ul style="list-style-type: none"> <li>◆ Storage               <ol style="list-style-type: none"> <li>1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.                   <ul style="list-style-type: none"> <li>• Recommended conditions                       <ul style="list-style-type: none"> <li>Ambient temperature : <math>-5\sim 40^{\circ}\text{C}</math></li> <li>Humidity : Below 70% RH</li> </ul> </li> <li>• The ambient temperature must be kept below <math>30^{\circ}\text{C}</math>. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes.                       <ul style="list-style-type: none"> <li>For this reason, product should be used within 6 months from the time of delivery.</li> <li>In case of storage over 6 months, solderability shall be checked before actual usage.</li> </ul> </li> </ul> </li> </ol> </li> </ul>  |
| Technical considerations | <ul style="list-style-type: none"> <li>◆ Storage               <ol style="list-style-type: none"> <li>1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.</li> </ol> </li> </ul>   |